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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/652,503	08/31/2000	Vernon M. Williams	4303US (99-0584)	3679

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EXAMINER

BREWSTER, WILLIAM M

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 07/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/652,503	Applicant(s) WILLIAMS, VERNON M.	
	Examiner William M. Brewster	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11,13,16-25,51-61,63 and 66-75 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

- 5) ☐ Claim(s) _____ is/are allowed.

- 6) ☒ Claim(s) 1-11,13,16-25,51-61,63 and 66-75 is/are rejected.

- 7) ☐ Claim(s) _____ is/are objected to.

- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.

- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All b) ☐ Some * c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)

- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.

- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

- 5) ☐ Notice of Informal Patent Application (PTO-152)

- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 22.

- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1 and 51 are rejected under 35 U.S.C. 102(b) as being anticipated by Takemoto, Japanese Patent No. 53,163,977 A.

Takemoto anticipates a method for encapsulating a substrate that substantially prevents voids in an encapsulant, the method comprising: in fig. 4, providing a transfer mold having an inner surface defining at least one mold cavity; providing at least one semiconductor substrate 3 having at least one surface with conductive elements thereon (inherently the semiconductor surface abutting the cavity may have microstructure protruding from the surface of such a dimension that they are not shown in detail from the macroscopic perspective) and a back surface thereof, positioning said at least one semiconductor substrate in said at least one mold cavity of said transfer mold so that portions of said inner surface of said transfer mold 9 abut with said conductive elements of said at least one surface of said at least one semiconductor substrate and another portion 11 of said inner surface 10 abuts with said back surface of said at least one semiconductor substrate; and introducing a flowable material, through gate 12, onto at least one semiconductor surface of said at least one

semiconductor substrate in an upward, non-horizontal direction in said at least one mold cavity so that said flowable material flows around said portions of said inner surface of said transfer mold abutting with said conductive elements on said at least one surface of said at least one substrate, CONSTITUTION.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2-11, 16-21, 24, 52-61, 63, 66-71, 74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takemoto as applied to claims 1, 51 above, and further in view of Sony Corporation, Japanese Patent No. 6-151492.

Takemoto does not specify using a vertically oriented cavity, but Sony does. Sony teaches a method of molding a semiconductor assembly in a mold cavity 13 of a transfer mold comprising: in fig. 7, providing an assembly, fig. 3, with carrier substrate and interposer including said at least one substrate, a die 15 with conductive structures protruding there from, the leads, having at least one surface in said mold cavity, positioning said at least one substrate substantially vertically; said transfer mold having said at least one cavity substantially vertically oriented, said transfer mold including at least one gate 8 at a lower portion of said at least one cavity and at least one vent 7 at

an upper portion thereof, and introducing a flowable material 16 onto said at least one substrate of said at least one substrate in a substantially vertical direction in said mold cavity, introducing said flowable material through said at least one gate, until a single flow front of said substantially uniform flow front of flowable material contacts said at least one vent at said upper portion of said at least one cavity, fig. 10 substantially filling said at least one cavity, encapsulating said at least one substrate, substantially preventing voids in said flowable material, USE/ADVANTAGE. Sony gives motivation in USE/ADVANTAGE. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Sony's process with Takemoto's invention would have been beneficial because the generation of voids and formation of an unfilled part do not occur.

Claims 13, 25, 63, 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takemoto in view of Sony as applied to claims 1-11, 16-21, 24, 51-61, 66-71, 74 above, and further in view of Chia et al., U.S. Patent No. 6,081,997.

Takemoto and Sony do not specify whether at least a portion of at least one-cavity preventing covering bond pads of the structures, but Chia does. Chia teaches, in fig. 1, a semiconductor substrate 10 having protruding conductive structures on an underside surface, and an upper surface, ABSTRACT, on the at least a portion of said at least one cavity 28 prevents said flowable material 32 from covering said conductive elements in the form of bond pads, using capillary action col. 2, lines 17-27, where cavity at least partially receives protruding structures (inherently the semiconductor

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surface abutting the cavity may have microstructure protruding from the surface of such a dimension that they are not shown in detail from the macroscopic perspective) of said at least one substrate, top of substrate 12, and at least prevents said flowable material from covering said conductive structures. Chia gives motivation in col. 5, line 64 - col. 6, line 24. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Chia's process with Takemoto's and Sony's invention would have been beneficial because the upper wall of second mold section holds the underside surface of substrate 14 against the upper surface of first mold section 20.

Sony and Chia do not specify using positive and negative pressure to move the flowable material. As applicant did not object to the use of Official Notice, this is now considered prior art.

Response to Arguments

Applicant's arguments filed 19 June 2003 have been fully considered but they are not persuasive. Applicant argues that Takemoto does not anticipate the independent claims 1 and 51 because they do not teach producing the flowable material onto said at least one surface in a substantially vertical direction. Examiner disagrees. Examiner notes that there is no requirement for the semiconductor chip to be in a vertical orientation, this is specified in dependant claims, rather it is the flowing material that must approach the surface from a vertical orientation. Takemoto anticipates this as in fig. 4, input port 12 is the source of the flowable material. As this lies well below the

surface of the semiconductor, the flowable material must enter the bottom and then slowly rise with increased volume to cover the at least one surface of the semiconductor substrate in a substantially vertical direction in said at least one mold cavity.

Applicant further traverses the §103(a) rejection of Takemoto in view of Sony. While it is true that Takemoto teaches the encapsulation of the bare die and Sony teaches the die paddle type lead frame-mounted semiconductor chip, either invention could adapt the other's substrate configuration; thus the two are compatible. Sony gives motivation in USE/ADVANTAGE. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that combining Sony's process with Takemoto's invention would have been beneficial because the generation of voids and formation of an unfilled part do not occur.

Applicant traverses the §103(a) rejection of Takemoto in view of Sony in view of Chia, because the solder bumps 16 are on the surface of the printed circuit board 14. Examiner concedes that the solder bumps 16 do not abut the molding, but inherently the semiconductor surface abutting the cavity may have microstructure protruding from the surface of such a dimension that they are not shown in detail from the macroscopic perspective, and these microstructure abut the inner surface of the molding.

Applicant traverses the §103(a) rejection of Takemoto in view of Honda. Examiner concedes that the use of Honda was misunderstood. However the limitations of positive and negative pressure have previously been addressed. In non-final rejection sent September 2001, examiner took official notice that positive and negative pressure acting on flowable material was well known in the art. As the applicant did not

traverse the subject in subsequent correspondence, examiner stated in the final rejection sent April 2002; it would be regarded as prior art of record.

For the above reasons, the rejection is considered proper.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William M. Brewster whose telephone number is 703-305-5906. The examiner can normally be reached on Full Time.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers

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for the organization where this application or proceeding is assigned are 703-305-3432 for regular communications and 703-305-3432 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

WB
July 23, 2003



Otk Chandrahuri
Supervisory Patent Examiner
Technology Center 2800